

NEW RECORDS OF NEMATODA (MONONCHIDA: IOTONCHIDAE) FROM INDIA

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ABSTRACT

Four new records of carnivorous nematodes categorized under order Mononchida Jairajpuri, 1969 belong to the family Iotonchidae Jairajpuri, 1969 recorded from the protected area of the Uttarakhand state, India. Female phenomena of Iotonchus tenuidentatus (Kreis, 1924) Mulvey, 1963; Mulveyvellus parazschokkei (Allgen, 1929) Andrassy, 1993; Iotonchulus darreni (Ahmad, Baniyammuddin & Jairajpuri, 2005) Vinciguerra & Orselli, 2006 and male phenomenon of Iotonchus sagaensis Khan, Araki & Bilgrami, 2000 reported during the current survey first time from India and present article represented detailed morphological descriptions of them.

KEYWORDS: *New Records, Iotonchulus darreni, Iotonchus sagaensis, Iotonchus tenuidentatus, Mulveyvellus parazschokkei, Rajaji National Park, Uttarakhand, India*

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INTRODUCTION

The genera *Iotonchus*, *Mulveyvellus* and *Iotonchulus* positioned under predatory Nematoda family Iotonchidae Jairajpuri, 1969 among Mononchids and they made individual identification by their dorsal-tooth position in buccal-cavity and tail-morphology. The genus *Iotonchus* Cobb, 1916 (Mononchida: Iotonchidae) reflected a differential morphology comparing to the rest of the categorized genera of the same family by having: 1) barrel-shaped buccal-cavity armed with small dorsal-tooth pointed anteriorly at or near the basal position of cavity, 2) absence of any longitudinal-ridge or denticles on subventral-walls. Genus *Mulveyvellus* Siddiqi, 1984 (Mononchida: Iotonchidae) exhibited distinguished morphology from the other representative genera by possessing: 1) varying position of dorsal-tooth from anterior-third to somewhat posterior or middle of the barrel-shaped buccal-cavity, 2) no evidence of longitudinal-ridge or denticles opposing the dorsal-tooth on subventral-walls of buccal-capsule, 3) tail conoid, ventrally-arcuate, no sign of caudal glands and spinneret. Genus *Iotonchulus* Andrassy, 1993 (Mononchida: Iotonchidae) showed morphology accompanying with: 1) Buccal-cavity barrel-shaped with dorsal-tooth pointed anteriorly at anterior-third of the cavity from the base, 2) absence of any longitudinal-ridge or denticles on opposite walls of dorsal-tooth. Previously India recorded around twenty species of *Iotonchus* with six species recorded from the Uttarakhand state, two species of *Mulveyvellus* and one species of *Iotonchulus* also reported from India. *Iotonchus tenuidentatus* originally reported and elaborated as *Mononchus (Iotonchus) tenuidentatus* by Kreis, 1924 from Paramaribo, Surinam (Dutch Guiana, South America) and near Eloise, Florida, U.S.A. and later from Nigeria by Mulvey, 1963. *Iotonchus sagaensis* both female and male phenomena was originally discovered & described as holotype specimen by Khan, Araki & Bilgrami, 2000 from Japan. *Mulveyvellus parazschokkei* originally described by Allegen, 1929 as *Mononchus (Iotonchus) parazschokkei* from Campbell Islands and New Zealand and later Andrassy, 1958 discovered the same from new continent Chile and compiled all reporting species of this genus in an article, 1993. *Iotonchulus darreni* originally

recorded and explained by Ahmad, Baniyamuiddin & Jairajpuri, 2005 from the forest-vegetation of Rifle range road, opposite Maurname reservoir, Singapore as *Iotonchus darreni* later Vinciguerra & Orselli, 2006 transferred this species to the genus *Iotonchulus* based on its different dorsal-tooth position compared to *Iotonchus*. The current findings from the protected area of Uttarakhand, India discovered female-specimens of *Iotonchus tenuidentatus* (Kreis, 1924) Mulvey, 1963; *Mulveyvellus parazschokkei* (Allgen, 1929) Andr ssy, 1993; *Iotonchulus darreni* (Ahmad, Baniyamuiddin & Jairajpuri, 2005) Vinciguerra & Orselli, 2006 along with the male-specimen of *Iotonchus sagaensis* Khan, Araki & Bilgrami, 2000 and their detailed morphological descriptions with figures presented in this article.

MATERIALS AND METHODS

Ranges under Survey

Rajaji National Park cradled in the foothills of bio diverse Himalayan terrain, valuable as one among all conserved areas in India as well as in the Uttarakhand state where the same declared as second tiger reserve after Corbett National Park in the state. The national park under current-subject-study encircled the Shivalik, nestled between Shivalik ranges and Indo-Gangetic plains over the 820 sq. km. areas (30°03'29" N; 78°10'22" E). During the extensive survey 2013-2016 among all the ranges covered, new records in this article discovered from the forest-ecosystem of Chilla-Range, Motichur-Range, Ramgarh-Range and from the soil around the roots of respective host forest-trees such as some unidentified forest-tree, Sain *Terminalia tomentosa*, Sheesham *Dalbergia sissoo*, Sal *Shorea robusta*.

Soil-Sample-Processing and Taxonomic-Analysis

Soil samples collected around the roots of the forest-host-tree and kept within air-tight collection polybags to keep the moisture content of soil in place for survival of the specimens along with the label bearing location, coordinates, host and date of collection details. Samples brought in the laboratory and processed under modified Baermann's funnel technique (1917), extracted microscopic forms from samples, followed by killing and fixation using 4% hot formalin. Specimens sorted from collection tubes and kept for dehydration in cavity-blocks containing fixatives along with specimens for 2-3 weeks. Proper dehydration made the specimens ready for preparation of wax-mounted permanent slides of nematodes. Permanent slides of specimens were identified-measured by Olympus BX41 microscope and photographed by Olympus BX51 microscope, edited in Microsoft Office Picture Manager and finally deposited-registered in National Zoological Collection, Zoological Survey of India, Northern Regional Centre, Dehra Dun, India.

Abbreviations: L= Total length; a= Total length/Maximum body-width; b= Total length/pharynx-length; c= Total length/tail-length; c'= Tail-length/Anal body-width; V= Anterior-Body-Length/ Total length x 100.

RESULTS

Iotonchus tenuidentatus (Kreis, 1924) Mulvey, 1963 (Figure1. A-B)

Measurements: *Female* (2): L= 1.96-2.06 mm; a= 30-32; b= 4.2-4.5, c= 5.2-5.4; c'= 8.5-9.5; V= 56-58. *Male:* Not found.

Description: large-sized nematode within the range of 2.0 mm length. Ventrally-curved posture upon fixation. Lip region markedly offset by a depression comparing to the adjacent cephalic region with 40-41 µm width and 15-17 µm length. Buccal-cavity 46 µm long and 29 µm wide. Dorsal-tooth apex pointed-antieriad, situated basally within the buccal-capsule, at 74-80% of buccal-cavity height from frontal-end and 20-26% of buccal-cavity height from basal-end.

Pharynx 456-470 μm long. Pharyngo-intestinal junction non-tuberculate. Reproductive system amphidelphic, overlapping, with differences in gonadal length on either sides of transverse slit-like vulval-opening. Distance of anterior gonadal-branch 180-200 μm and posterior-gonadal branch 140-155 μm on either sides of vulval-opening. Tail moderately-elongate-conoid, curved ventrally, 341-379 μm long or 8.5-9.5 anal body diam. long, regularly tapering towards tail-tip and with narrowly-rounded terminus. Caudal glands present and spinneret sub-terminal ventrally.

Habitat & Locality: Soil around the roots of unidentified forest-host-tree-species, near Chilla-Range-Office, Rajaji National Park, Lat 29.940337° N and Lon 78.240871° E.

Distribution: Nigeria, Kenya, Suriname, Costa Rica, USA-Florida.

Remarks: Recorded first time from India.

Iotonchus sagaensis Khan, Araki & Bilgrami, 2000 (Figure2. A-C)

Measurements: *Female*: Not found. *Male* (1): L= 2.4 mm; a= 41; b= 4.2, c= 10; c'= 4.1; spicules= 102 μm ; ventromedian supplements= 12.

Description: large-sized nematode greater than 2.0 mm in length. Ventrally-curved posture upon fixation. Lip region markedly offset comparing the adjacent cephalic region with 45 μm width and 15 μm length. Buccal-cavity 50 μm long and 30 μm wide. Dorsal-tooth apex anteriorly-pointed, situated in basal position of buccal-capsule, at 70% of buccal-cavity height from frontal-end and 30% of buccal-cavity height from basal-end. Pharynx 575 μm long. Pharyngo-intestinal junction non-tuberculate. Long-slender spicules of 102 μm length, gubernaculum 32 μm long and ventromedian supplements 12 along with the presence of lateral accessory organs. Tail elongate-conoid, ventrally bent almost with an open 'C'-shaped structure, 250 μm long or 4.1 anal body diam. long, regularly tapering towards tail-tip and with narrowly-rounded terminus. Caudal glands present and spinneret terminal.

Habitat & Locality: Soil around the roots of host species *Sain Terminalia tomentosa*, Motichur-Range, 1km before range office, Rajaji National Park, Lat 30°1'0" N Lon 78°10'57" E and Alt 300.905 m.

Distribution: Japan.

Remarks: Recorded first time from India.

Mulveyvellus parazschokkei (Allgen, 1929) Andrassy, 1993 (Figure3. A-B)

Measurements: *Female* (1): L= 0.94 mm; a= 22; b= 3.1; c= 14; c'= 3.3; V= 66. *Male*: Not found.

Description: Small-sized nematode approx. 1.0 mm length. Ventrally-curved posture upon fixation. Lip region markedly offset comparing the adjacent cephalic region with 26 μm width and 10 μm length. Buccal-cavity 28 μm long and 17 μm wide. Dorsal-tooth apex anteriorly-directed, situated in posterior-middle of buccal-cavity, at 60% of buccal-cavity height from basal-end and 40% of buccal-cavity height from anterior-end. Pharynx 298 μm long. Pharyngo-intestinal junction tuberculate. Reproductive system amphidelphic, overlapping, almost equal gonadal length on either sides of transverse slit-like vulval-opening. Distance of anterior gonadal-branch 88 μm and posterior-gonadal branch 85 μm on either sides of vulval-opening. Tail showed ventral hook-like curvature towards posterior extremity, 69 μm long or 3.3 anal body diam. long, conical with even tapering towards tail-tip and narrowly-rounded end. Caudal-glands and spinneret were not evident.

Habitat & Locality: Soil around the roots of host species Sheesham *Dalbergia sissoo*, away from Chilla-Range-office, Rajaji National Park, Lat 29.918621° N and Lon 78.233464° E.

Distribution: Chile, New Zealand, Campbell Islands.

Remarks: Recorded first time from India.

Iotonchulus darreni (Ahmad, Baniyamuiddin & Jairajpuri, 2005) Vinciguerra & Orselli, 2006 (Figure4. A-B)

Measurements: *Female* (4): L= 1.1-1.3 mm; a= 33-40; b= 4.2-4.6; c= 3.1-3.8; c'= 13-15; V= 54-61. *Male*: Not found.

Description: Medium-sized nematode greater than 1.0 mm but less than 1.5 mm in length. Ventrally bent posture after fixation. Lip region markedly offset comparing the adjacent cephalic region with 24-26 µm width and 10 µm length. Buccal-cavity 26-30 µm long and 16-17 µm wide. Dorsal-tooth apex anteriorly-directed, positioned in approx. anterior-third of buccal-cavity from base, at 66-70% of buccal-cavity height from basal-end and 30-34% of buccal-cavity height from anterior-end. Pharynx 260-295 µm long. Pharyngo-intestinal junction non-tuberculate. Reproductive system prodelphic, without any sign of post-uterine branch, overlapping, intestine contracted near gonadal region, transverse slit-like vulval-opening. Distance of anterior gonadal-branch 130-173 µm from vulval-opening. Tail elongate-conoid, ventrally bent almost with an open 'C'-shaped structure, 333-370 µm long or 13-15 anal body diam. long, regularly tapering towards tail-tip and pointed-conical terminus. Caudal glands and spinneret poorly developed.

Habitat & Locality: Soil around the roots of host species Sal *Shorea robusta*, Ramgarh-Range Asarori Comp. No. 10 and Ramgarh-Range near Phandowala Chowk, Rajaji National Park, Lat 30°13'49" N; Lon 77°58'58" E; Alt 696.380 m and Lat 30°12'42" N; Lon 78°0'28" E; Alt 611.847 m respectively.

Distribution: Singapore.

Remarks: Recorded first time from India.

DISCUSSIONS

Last time new species of *Iotonchus* Cobb, 1916 reported by Jana, Chatterjee & Manna, 2007 from India and after that no new records or new species belonging to same genus came into view. Previously two species of *Mulveyvellus* Siddiqi, 1984 reported from India, one was the type specimen *Mulveyvellus jairi* (Lordello, 1959) Siddiqi, 1984 and another one *Mulveyvellus shamimi* (Patil & Khan, 1982) Andrassy, 1993. Only one species of *Iotonchulus* Andrassy, 1993 recorded last time from India, i.e. type specimen *Iotonchulus longicaudatus* (Baqri, Baqri & Jairajpuri, 1978) Andrassy, 1993. Rajaji National Park, Uttarakhand, India reported two new records of *Iotonchus* almost a decade after and one new record each of *Mulveyvellus* and *Iotonchulus* multiple of one decade after. The present article provided all these new records of Mononchids belong to Iotonchidae Jairajpuri, 1969 from India after such a long time with detailed morphological characterizations.

CONCLUSIONS

Among varied feeding-groups of nematodes Mononchids occupied higher trophic group in soil and known as 'soil-tiger'. Around 140 species of Mononchids reported from our subcontinent in past years, among them more than 30 reported species belong to family Itonchidae. Our present survey and report of new records made additions in the national predatory nematode species-list and also updated the Uttarakhand state soil faunal diversity as well as species-diversity of plant-soil nematodes from India.

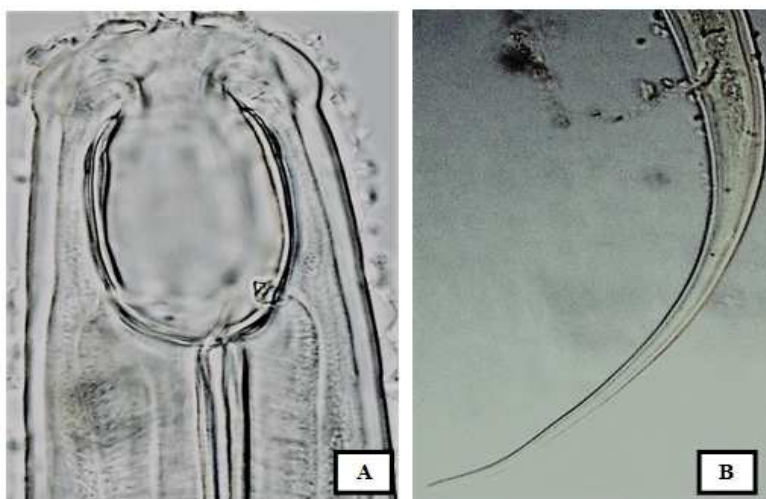


Figure1. A-B: *Itonchus tenuidentatus* (Kreis, 1924) Mulvey, 1963. A: Head, B: Tail



Figure2. A-C: *Itonchus sagaensis* Khan, Araki & Bilgrami, 2000.
A: Head, B: Male Reproductive System, C: Tail

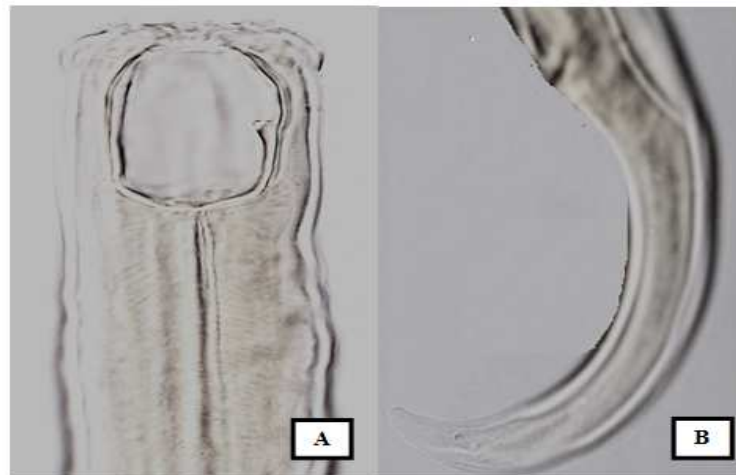


Figure3. A-B: *Mulveyvellus paraszchokkei* (Allgen, 1929) Andrassy, 1993. A: Head, B: Tail

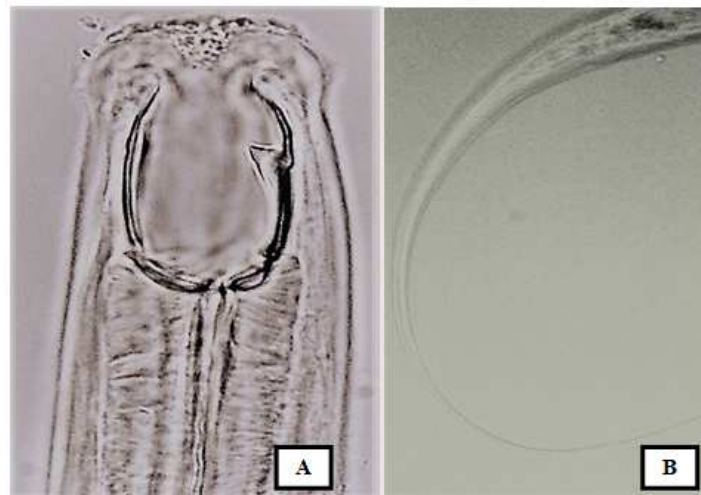


Figure4. A-B: *Iotonchulus darreni* (Ahmad, Baniyammuddin & Jairajpuri, 2005) Vinciguerra & Orselli, 2006. A: Head, B: Tail

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